OREGON HOUSING & COMMUNITY SERVICES

Multifamily Energy Program

EMERGING TECHNOLOGIES, Variable Refrigeration Flow Heat Pumps

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WHAT IS A VRF SYSTEM?

- **Traditional Mini-Split Heat Pumps** are ductless systems made of **2 to 8 indoor units per 1 outdoor unit,** connected with wiring and refrigerant tubing. With mini-splits, **it's more energy-efficient to have one outdoor unit supplying multiple indoor units than having an outdoor unit per each indoor air blower**, like a Package Terminal Heat Pump (PTHP).

- **Variable Refrigerant Flow Heat Pumps (VRFs)** are a more sophisticated ductless systems that **operates on the same principle as a multiple mini-split system**. The crucial **difference is** that one outdoor unit can support as many as 48 indoor units. Unlike multiple mini-splits, **it's possible to heat one room and cool another** with VRF technology.

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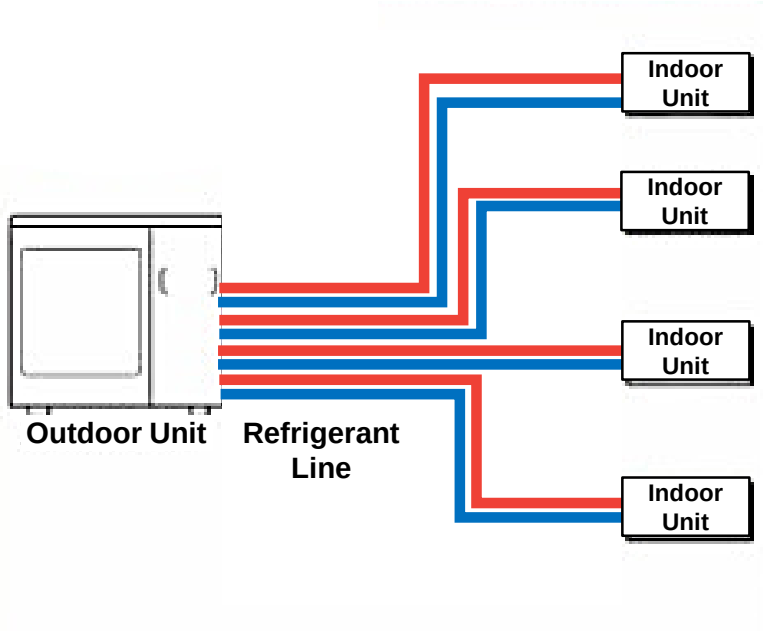
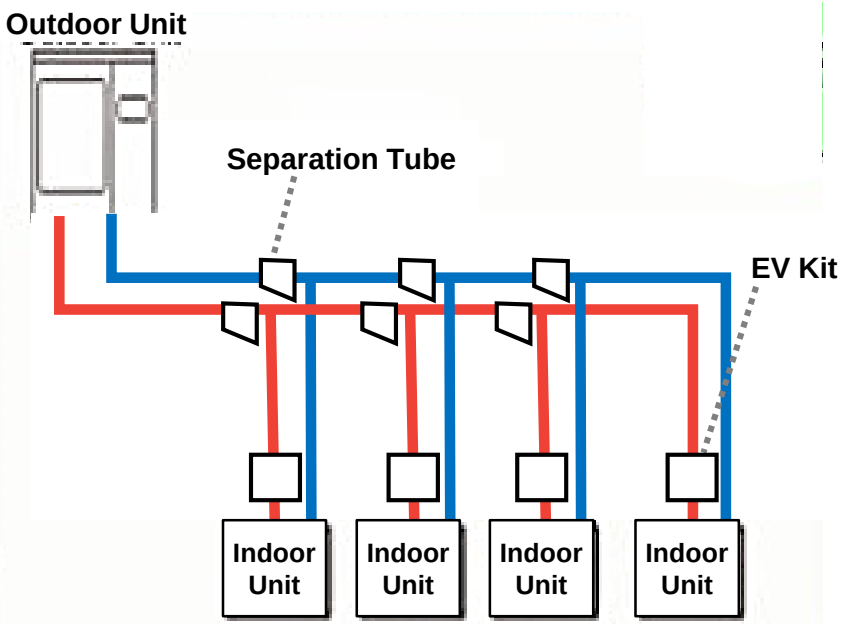
VRF VS MINI-SPLIT HEAT PUMP

Mini-Split Heat Pump



VRF Heat Pump



Images courtesy of wanderingwith.us

HOW DO VRF SYSTEMS WORK?

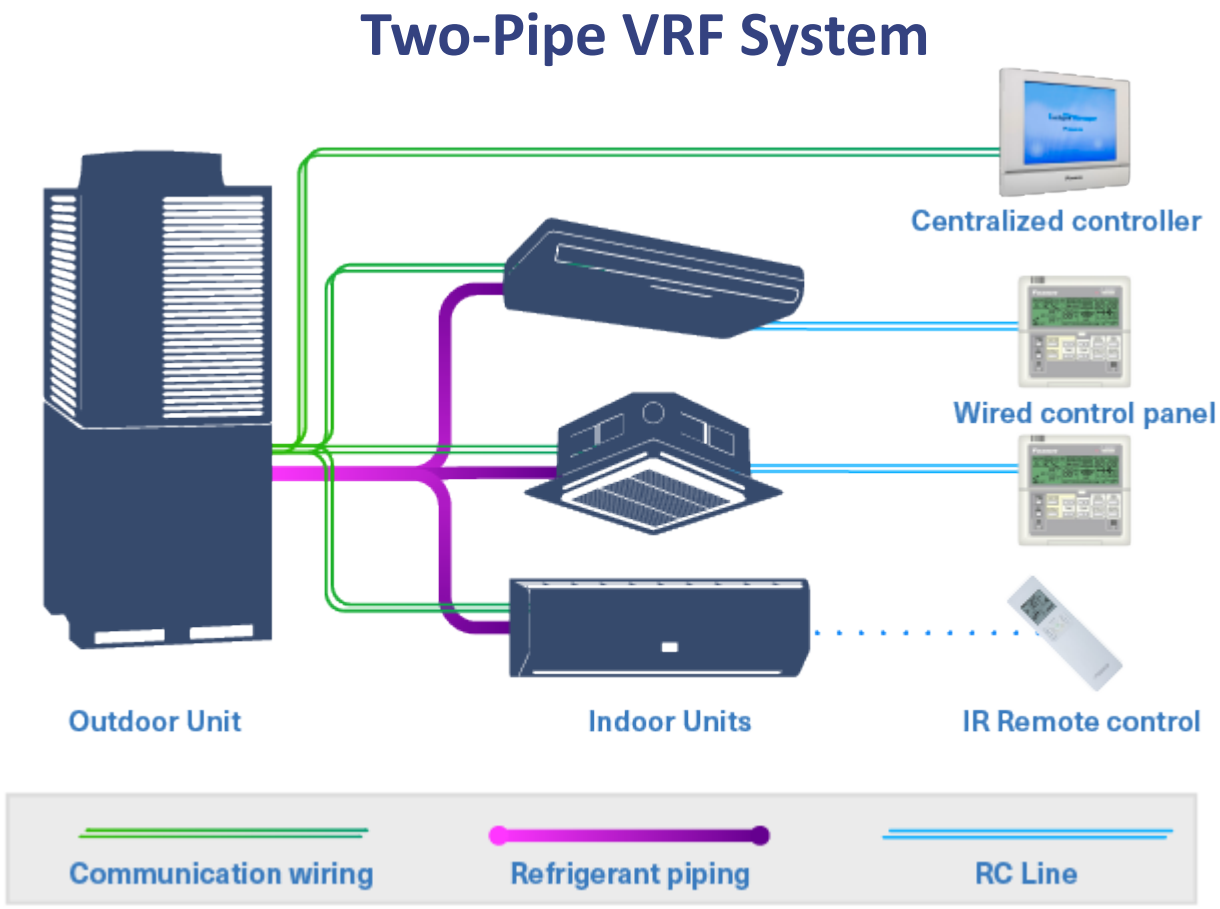
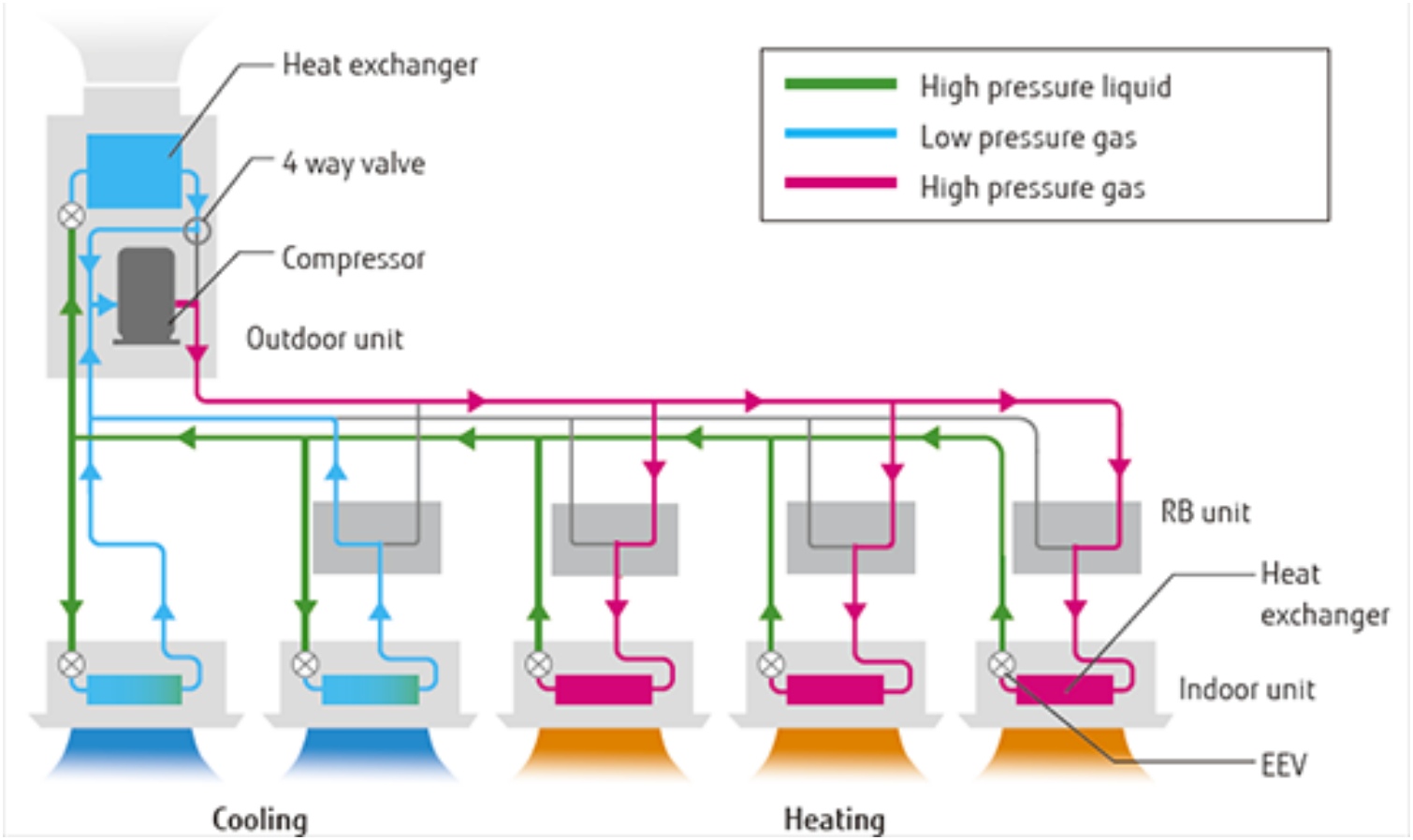


Image courtesy of www.coolautomation.com

HOW DO VRF SYSTEMS WORK?

Three-Pipe VRF System with Heat Recovery



Images courtesy of Fujitsu

WHY IS VRF A GOOD FIT FOR MULTIFAMILY BUILDINGS?

VRF Compared to Packaged Terminal Heat Pumps (PTHPs) & Electric Resistance Baseboard

- Fewer penetrations in the building than PTHPs (a central entry point vs one (or more) per unit
- Ability to provide zonal control, with some units heating and others cooling
- Higher efficiency than either PTHPs or electric resistance
- Greater ability to perform in heat pump mode below 35°F

VRF Compared to Traditional Mini-Split Ductless Heat Pumps:

- Ability to provide heating and cooling simultaneously in different apartments
- Can have more indoor heads per outdoor unit

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NEW CONSTRUCTION VS. RETROFIT CONSIDERATIONS

Consideration	New Construction	Existing Buildings
Building Disruption	Refrigerant lines can be run though a 3” hole per outdoor unit and can be run between floors and walls	One penetration for multiple units, best suited when interior is also being renovated. Ductless offers flexibility.
Energy Efficiency	Highest COP available for most scenarios. Typically 5-10% more efficient than standard heat pumps	Over 3 times as efficient as electric resistance baseboards, and 25% more efficient that PTHPs
Zonal Control	2 outdoor units provide zonal control for most buildings compared to 6 when using mini-split DHPs	Same zonal capabilities of PTHPs and electric resistance, but provides heating and cooling
Costs	Can cost 10-35% more than mini-split DHPs	Can cost 90% more than PTHPs

WHY CONSIDER VRFs NOW?

Trained installers are more wide-spread.

Efficiencies and performance of both mini-splits and VRF systems have progressed.

More advanced envelopes allow systems that excel in moderate to partial load scenarios to be preferred.

Cooling is now an expected amenity in multifamily buildings.

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INFLUENCE ON OR-MEP INCENTIVES

Tier	Savings Threshold	Incentive
Tier 1	≥ 20% kWh savings compared to baseline*	$0.80 / kWh saved
Tier 2	≥ 25% kWh savings compared to baseline*	$0.90 / kWh saved
Tier 3	≥ 30% kWh savings compared to baseline*	$1.00 / kWh saved

**baseline is code in New Construction and existing conditions for retrofits*

Incentives for Whole Building Path calculated as follows:

[% Savings Incentive Tier Rate ($/kWh)] X [Total kWh Modeled Savings]

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THANK YOU FOR ATTENDING

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